PATENT SPECIFICATION

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(72) Inventors DAVID MURRAY HARLEY
PETER JOHNSON

(19) THE PATENT OFFICE LONDON

(54) IMPROVEMENTS RELATING TO MOUNTINGS FOR ELECTRICAL CIRCUIT UNITS

(71) We, FERRANTI LIMITED, a Company registered under the Laws of Great Britain of Hollinwood in the County of Lancaster, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to mounting for electrical circuit units such as printed circuit boards.

To facilitate servicing, electrical circuit units such as printed circuit boards are preferably mounted so that they are easily removable. Each board may be provided with terminals along one edge to engage a corresponding connector in a terminal block or on another printed circuit board. Other edges of the board, opposing each other, may be supported and located relative to the connector by guides such as milled grooves in sidewalls or slots in comb-like members. Separate clamps or springs may be provided to hold the boards firmly in position.

According to the present invention a guide member for supporting a plug-in electrical circuit unit comprises a sheet of material moulded to define at least parts of a groove of non-linear profile arranged to retain an edge of the unit, by relative resilient deformation of the said edge and of the cooperating parts of the guide member.

The relative deformation and resilience of the edge and the portions enable the guide member to hold the unit firmly in position.

Where the plug-in unit is a printed circuit board, the groove may be continuous and wavy in profile. The difference in width between the board and the grove and the waviness of the grove may be such that, when the board is inserted, its edge will bend to try to follow the wavy groove.

When a plurality of grooves are provided, they may be arranged to be generally parallel to each other and holes may be provided in portions of the guide member between the grooves to direct cooling air into spaces between adjacent boards to cool components mounted on one of the adjacent boards.

The guide member is preferably produced by vacuum moulding of sheet thermoplastic material, such as polycarbonate and for which a suitable moulding tool is described in our co-pending application No. 21059/75 (Serial No. 1503782) to which reference is hereby directed for details of how to make a suitable moulded polycarbonate sheet.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a plan view of equipment in which a plurality of printed circuit boards are supported parallel to each other for connection to printed circuit board at right-angles to them,

Figure 2 shows a guide member of the type used in the equipment of Figure 1,

Figure 3 is a sectional view of a portion of a guide member similar to that shown in Figure 2,

Corresponding parts are given the same reference numeral in each Figure.

In Figure 1, a rectangular housing 10 has fastened to its base 11 a printed circuit board 12. Opposed walls 13 of the housing carry guide members 14 which have grooves 15 arranged at right angles to printed circuit board 12. Slidably located in the grooves are printed circuit boards 16, hereinafter referred to as daughter boards, which engage the printed circuit board 12, hereinafter referred to as the mother board, at right-angles.

When the boards are in position, the printed circuits of the daughter boards are connected to those of the mother board by way of edge connectors 17 on the daughter boards, having pins passing through holes 18 arranged in rows on the mother board.

A guide member 14 is shown in Figure 2, from which it can be seen that the grooves 15 are wavy in profile. The waviness and stiffness of each groove are preferably such that when a printed circuit board is inserted into the groove, at least the board deflects to such extent that the resilience of the board produces enough force between the board and the groove to hold the board securely in position. One sidewall of each groove has straight end portions 19, one of which, when the guide member is assembled in the housing, is adjacent to the mother board. The wavy parts of the grooves are so disposed that the board will be pressed into contact with the straight portions of the groove sidewall. This facilitates correct registration of the edge connector of each daughter board with the corresponding connector on the mother board.

The guide member 14 is made by vacuum moulding a thin sheet of polycarbonate material. As shown in Figure 3 peripheral walls 20 of the guide member 14 are higher than the depth of the grooves. When the guide member is fastened to the housing wall 13, a chamber 21 is formed into which cooling air is blown. Holes 22 in the parts of the guide member between the grooves direct the cooling air between adjacent printed circuit boards to cool components on the board. The size and position of each hole 22 is determined by the cooling requirements and location of the components to be cooled.

The holes 22 are obtained quite easily by providing a blister 23 when the guide is moulded. After moulding, part of the blister is cut off near its base leaving the desired hole, preferably with a rim around it to provide stiffening.

Although the wavy grooves described are continuous, it will be appreciated that a similar effect could be obtained by a series of projections from an otherwise flat guide member, projections being arranged to cooperate with each side of a board to flex the board and produce the force required to hold it in place.

In the embodiment described, the grooves are provided with straight end portions 19 to ensure correct regisration of the daughter board connector with the connector on the mother board. Whilst this arrangement is preferred, it will be appreciated that it is possible to locate the points of contact between the groove and the board so that the board is correctly registered. This applies especially when a series of projections are provided rather than a continuous groove.

Straight end portions may be provided at both ends of a groove so that a particular guide member may be fitted to either wall 13 of the housing 10 of Figure 1. When straight portions are provided at one end only of a groove, a particular guide member should be fitted so that the end portions are adjacent to the edge of the board which requires accurate registration.

Alternatively, correct registration may be achieved by providing both sides of the ends of a groove with straight portions which will fit closely against the sides of the board.

Because of its corrugated nature, a guide member as described above may have a required rigidity yet be made from thin thermoplastic material. This enables a cheap, lightweight guide member to be produced, particularly suitable for use in mobile equipment.

The equipment described above includes two guide members having wavy grooves. In some applications only one guide member need provide a firm grip on the board so that the other guide member may be of similar construction but with straight grooves to provide the necessary location and support.

Although the invention has been described with particular reference to the mounting of printed circuit boards for connection to a parent board, it is applicable generally to the mounting of any electrical circuit unit which has a resilient edge portion to co-operate with a grove of the kind described.

WHAT WE CLAIM IS:—

1. A guide member for supporting a plug-in electrical circuit unit comprising a sheet of material moulded to define at least parts of a groove of non-linear profile arranged to retain an edge of the unit by relative resilient deformaton of the said edge and of the co-operating parts of the guide member.

2. A guide member as claimed in claim 1 wherein the groove is continuous.

3. A guide member as claimed in either of claims 1 or 2, wherein the groove is wavy in profile.

4. A guide member as claimed in any preceding claim, wherein at least one end of the groove has a linear profile at one side, the non-linearity of the profile of the remainder of the groove being such that the edge of the unit will be pressed against the linear portion to locate the unit positively.

5. A guide member as claimed in any one of claim 1 to 3, in which at least one end of the groove has a linear profile on both sides to fit closely against the sides of the edge of the unit and positively locate the unit.

6. A guide member as claimed in any preceding claim, which provides part at least of each of a plurality of non-linear grooves arranged to be generally parallel to each other.

7. A guide member as claimed in any preceding claim in which holes are formed adjacent to a groove to direct cooling air on the side of the plug-in unit.

8. A guide member as claimed in claim 7, in which the moulded sheet is formed with peripheral walls extending in a plane generally at right-angles to the plane of the groove or grooves such that when the member is secured to a surface, the sheet walls and surface provide a chamber through which cooling air may be passed.

9. A guide member as claimed in any preceding claim, in which the moulded sheet is of thin polycarbonate material.

10. A guide member for supporting a plug-in electrical circuit unit substantially as described herein with reference to and as shown in the accompanying drawing.

11. An equipment housing for plug-in electrical circuit units substantially as described herein with reference to and as shown in Figure 1 of the accompanying drawings.

A. R. COOPER,
Chartered Patent Agent,
Agent for the Applicants.

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1503781 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

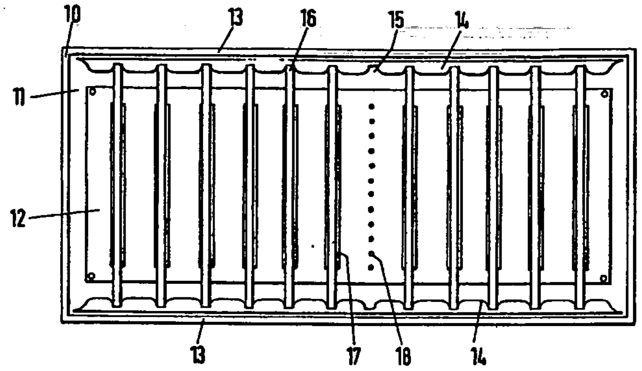

FIG.1

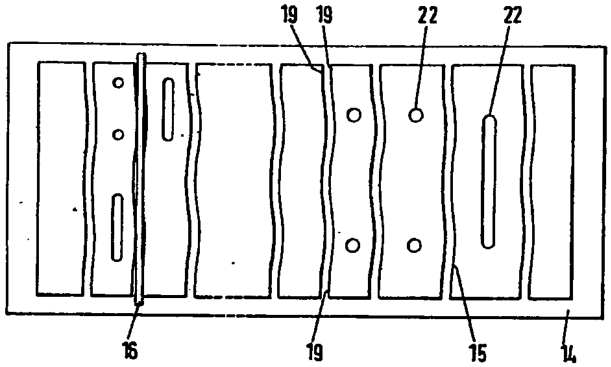

FIG.2

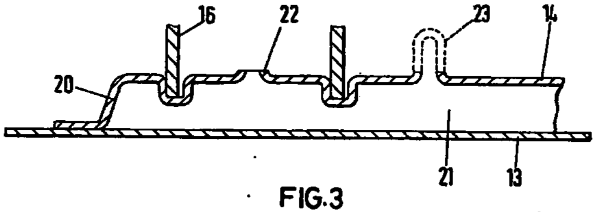

FIG.3